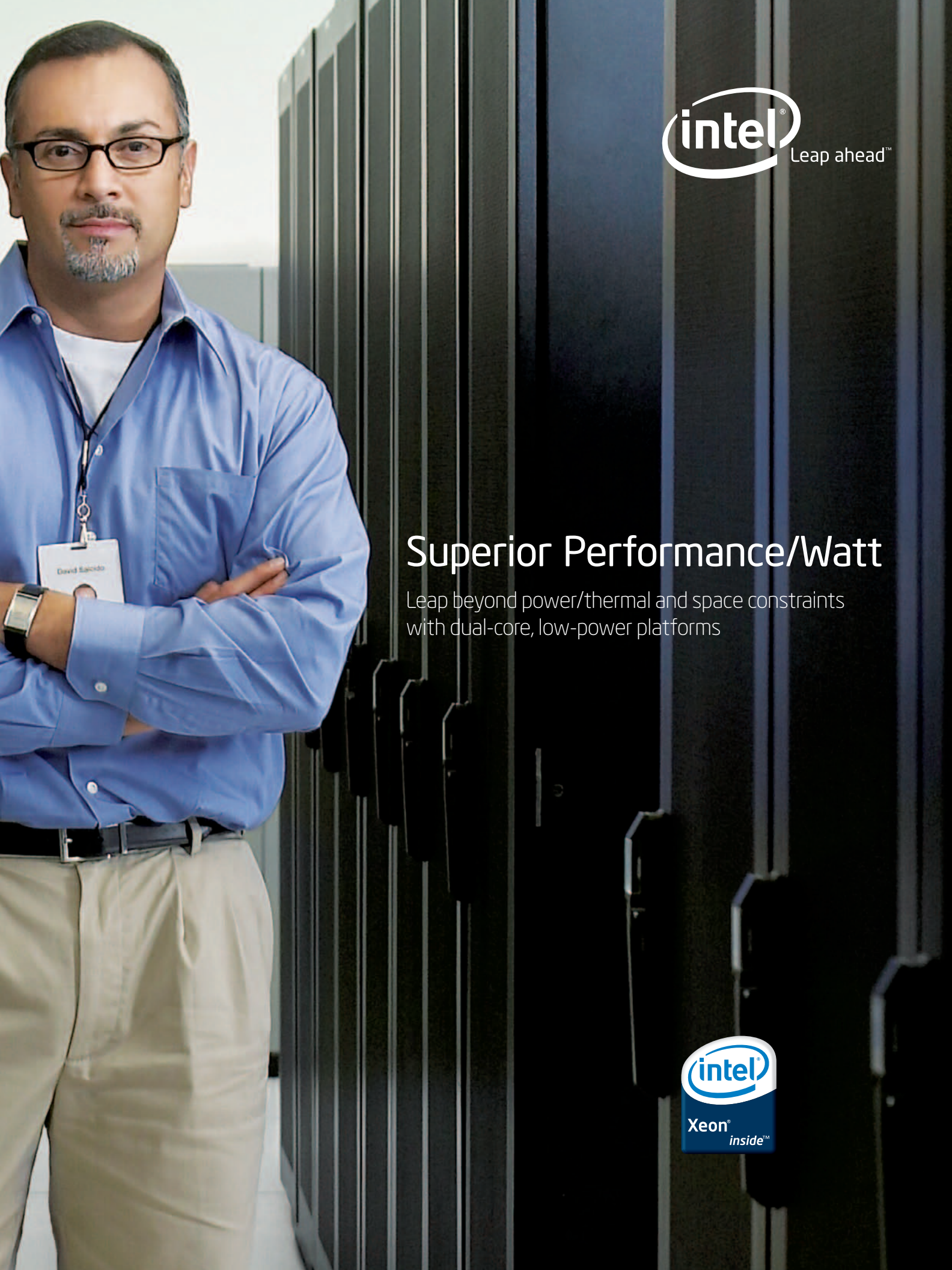

intel
Leap ahead™
Superior Performance/Watt
Leap beyond power/thermal and space constraints
with dual-core, low-power platforms
intel
Xeon®
inside™

# Build success into your business.

Your IT challenges are relentless. So are our passion and drive to deliver the right technology solutions for you, whether your critical focus is on multi-core/multi-processor performance, server density and virtualization, cost reduction and management efficiency, power/thermals, migrating to 64-bit computing, or all at the same time. With the best Intel® technologies built into your infrastructure, you build success into your IT services and your business.

Intel continues to build more capabilities into our platforms so you can do your job better. To face your key challenges head-on with the right solution in the right place at the right time, you get a broad and complete set of choices, so you can optimize your data center to deliver the right services more efficiently and at the lowest TCO. And, with millions of Intel® processor-based servers shipped since 1996, and a 20-year track record of delivering enterprise-class performance, you know you can count on Intel to deliver superior quality and reliability.

## Dual core and low power. A winning performance/watt combination.

Intel is committed to providing IT departments with more powerful and power-efficient platforms that deliver increased performance/watt for greater processing per square foot. Intel's power-performance roadmap allows companies to balance computing demands with power/thermal requirements and space limitations throughout their infrastructure in order to maximize resources. Intel's strategy encompasses the entire platform, including processor and surrounding technologies, such as new memory technologies and chipset enhancements. The Dual-Core Intel® Xeon® processor LV 2.0 GHz is one of many products on this roadmap.

Intel's low-power server platforms based on the Dual-Core Intel Xeon processor LV 2.0 GHz are designed for ultra-dense deployments where reducing power consumption is critical. Delivering up to 2X performance/watt improvement over our previous single-core processors, server platforms based on the Dual-Core Intel Xeon processor LV 2.0 GHz , the Intel® E7520 chipset, and DDR2-400 memory, enable you to deliver more services where power/thermal concerns and physical space constrain data center expansion.

# Discover new possibilities for your data center

Intel's dual-core, low-power platforms are taking new leaps, enabling exciting new possibilities for your data center. Just imagine what you could accomplish with more performance in less space. How many new services could you launch with more time and budget? How much could you save with greater efficiencies and higher reliability? Rack-optimized server platforms based on the Dual-Core Intel Xeon processor LV 2.0 GHz can help you leave the status quo behind, move forward, and stay ahead with new services for your business.

The solution is in the platform. Intel technologies — optimized for high-density, low-power deployments — let you attack your critical power/thermal and physical space concerns at the source with more processor performance, lower power consumption, and denser form factors.

At approximately 31 watts total dissipated power, Intel's lowest power, dual-core server processor enables high-performance 32-bit computing, enabling ultra-dense deployments using dual-processor blades and 1U rack units systems. These platforms are ideal for high-performance computing clusters and grid computing found in technical server farms and financial services, especially where power and space are critical.

## Dual-core, low-power computing helps give you more processing/ft$^2$

In today's environment, one platform cannot meet the many kinds of services IT departments must deliver. Where rack density *and* processing performance matter, Intel® dual-processor platforms based on dual-core technology for the densest deployments are an ideal choice for greater processing/ft$^2$ — with fewer power/thermal concerns.

Dual-core processing — the new technology leap for computing, soon to be followed by multi-core — gives you the performance advantage to get a lot more done with much less. Two independent processing cores in the same package give your applications more resources to deliver faster results and improve user productivity. Dual-processor blade or 1U case servers are expected to give you 4X the processing resources of earlier single-core, single-processor systems, plus the trusted reliability and easy manageability of Intel® server platforms built in.

## Reduce your power/thermal demands and space constraints

Rising costs of electricity and cooling bring power/thermal issues to the top of the list of IT concerns today. Add the sky-rocketing cost of data center space in urban areas and you have a formula that prevents critically needed data center expansion, limiting the ability of IT departments to offer new and better services that can keep their businesses agile and competitive.

The Dual-Core Intel Xeon processor LV 2.0 GHz is Intel's lowest power, dual-core server processor, designed for the densest dual-processor deployments in single-height chassis and blade form factors. This superior performance, lowest power server processor enables you to deliver more services in data centers where power/thermal limits and physical space constrain expansion.

## Up to 2X performance/watt improvement

With an estimated 31 watts of total dissipated power (TDP), dual-core technology, 32-bit computing, a 667 MHz system bus, and support for up to 16 GB of memory, the Dual-Core Intel Xeon processor LV 2.0 GHz excels where other processors cannot, and delivers up to 2X performance/watt over previous versions of Intel® single-core processors.

This new generation of ultra-dense servers goes beyond the processor to offer greater power savings, better management, and increased reliability and security in smaller spaces.

# A comprehensive platform approach to power/thermal challenges

### Cut CPU power consumption up to 24 percent with Demand-Based Switching (DBS) with Enhanced Intel SpeedStep® technology

Enhanced Intel SpeedStep® technology enables power management features that match processor power consumption to application performance, resulting in approximately 25 percent energy savings. When utilization is high and the processor demands maximum performance, the processor is automatically switched to a high operational state. When CPU utilization drops, it is switched to a lower power state without impacting application performance. Maximum power conservation occurs during idle periods, when demand is at its lowest. Demand-Based Switching (DBS) reduces energy consumption and lowers acoustic impact from fans, helping cut noise levels in the data center.

### Reduce memory power demand approximately 40 percent while increasing bandwidth with DDR2-400 memory

More processing capacity and higher system bandwidth puts pressure on other parts of the platform. Faster, dual-channel memory designs with better memory bandwidth and reduced latency can keep pace with data movement to and from memory. But, only DDR2-400 memory reduces the power demand by up to 40%. With up to 16 GB of addressable memory by the Dual-Core Intel Xeon processor LV 2.0 GHz , dense system deployments benefit with lower power demands, while meeting the needs of memory-intensive applications using DDR2-400 memory.

### Enhance performance for data-intensive applications with PCI Express*

PCI Express* (PCIe*) has quickly become the mainstream I/O technology of today. It provides the necessary bandwidth and lower latency to keep up with the capabilities of dual-core computing. A PCI Express x1 ("by 1") link delivers a bi-directional peak bandwidth of 500 MB/s, while x4 and x8 links provide 2 GB/s and 4 GB/s, respectively. The lower latency and the increased bandwidth help deliver the throughput required to fully utilize the processor's improved capabilities.

The Intel E7520 chipset supports multiple PCIe interfaces. Using the Intel® chipset, PCIe adapters have a direct path to the chipset's memory controller, which helps minimize latency between the I/O adapter and the memory controller, improving I/O performance.

Deployments of powerful, ultra-dense servers allow new service offerings in data centers constrained by power/thermals and space.

| Platform Features | User Benefits |
|---|---|
| Dual-Core Intel® Xeon® processor LV 2.0 GHz | ▪ Up to 2X higher performance/watt over previous-generation, single-core processors<br>▪ Reduced overall power demand |
| Demand-Based Switching (DBS) with Enhanced Intel SpeedStep® technology | ▪ Enables platform and software power management features to help lower average power consumption while maintaining application performance and improving acoustics |
| DDR2-400 memory | ▪ Provides an estimated 20% increase in memory bandwidth over DDR-333<br>▪ Up to 40% lower power consumption vs. DDR-333<br>▪ Increased DIMMs per system for enhanced memory scalability |
| Execute Disable Bit | ▪ Provides added security and operational efficiency<br>▪ Helps prevent certain classes of malicious "buffer overflow" attacks |
| 36-bit PAE | ▪ Address up to 16 Gb of memory<br>▪ Increased performance over traditional 32-bit platforms |
| PCI Express* serial I/O | ▪ Next-generation I/O capable of up to 8 GB/s peak bandwidth<br>▪ Improved RAS features compared to PCI-X*<br>▪ Lower latency compared to PCI-X for improved I/O performance<br>▪ Software compatible with PCI-X to simplify parallel-to-serial transition |
| Enhanced reliability and manageability | ▪ Many memory controller features, together with PCI Express RAS features combine to help improve platform reliability vs. previous-generation platforms<br>▪ New features include Error Correcting Code (ECC) system bus, new memory RAID, and I/O and memory hot-plug<br>▪ The Intel® E7520 chipset includes an SMBus port for remote management operation and support for a variety of third-party BMC (base management controller) and BIOS solutions |
| Streaming SIMD Extensions 3 (SSE3) instructions | ▪ Improved multimedia and encryption/decryption processing over previous generation, along with support for more computationally intensive graphics |
| PIROM and thermal sensor | ▪ Allows for scheduled service in the event of a system manufacturing defect or cooling device failure |

# Increase data center utilization even further with virtual environments running on Intel® low-power, high-density platforms

Virtualization on platforms based on the Dual-Core Intel Xeon processor LV 2.0 GHz helps you maximize utilization from your data center and improve management efficiencies while reducing power and cooling demand. Virtualization is a trusted, proven technology that transforms your IT environment into a more powerful, flexible, and robust infrastructure. It consolidates multiple environments onto a single server, providing increased security through environment partitioning, higher availability with automated failover, a simpler hardware infrastructure, and faster service deployment.

With fewer systems, virtualization simplifies the IT infrastructure, making it easier to manage resources. Together with dual-core, low-power platforms from Intel, virtualization translates to significant bottom-line savings, giving you greater flexibility with your IT budgets.

## Manage heterogeneous systems easier

The Intel E7520 chipset provides an SMBus interface that supports multiple third-party baseboard management controller (BMC) and firmware solutions. This level of embedded support is necessary to enable remote management of high-density platforms based on the Intelligent Platform Management Initiative (IPMI). Support for multiple third-party solutions not only provides flexibility and customer choice, it also represents a significant advancement in management software interoperability, greatly simplifying system management, especially in dense heterogeneous, virtual environments.

IPMI helps enable management of dense heterogeneous systems through:

- Instrumentation in motherboard hardware
- Standards-based architecture for systems and asset management
- Interoperability between hardware and software management
- Reliability through a hierarchy of sensors that report alerts to remote consoles
- Common architecture that applies to the 3-tier server architecture prevalent in modern data centers
- Helping to reduce TCO and administration with the use of common software user interfaces across multiple servers from multiple vendors


Intel®-based servers support more than 20 operating systems and thousands of applications, all validated and optimized for high-availability, performance, and reliability.

# Reduce downtime with enhanced memory protection

**The Intel E7520 chipset delivers enhanced reliability features that keep systems available when memory faults and errors occur**

Error Correcting Code (ECC) – The system detects single-bit and double-bit errors and automatically corrects single-bit errors on internal data paths.

Memory RAID – Similar to RAID for disks, Memory RAID uses partitions of the system memory as independent, redundant data stores to help enable reconstruction of the system data even in the event of a memory board failure.

Demand and patrol scrubbing – The system proactively searches the system memory, repairing correctable errors or permanently marking the memory location as unreadable.

SMBus with PIROM and thermal sensor – This feature allows for scheduled service in the event of a system manufacturing defect or cooling device failure, going to a lower power state if a critical temperature is reached.

Memory mirroring – Splits the memory subsystem and duplicates the data in each half. The redundant memory image is used as a check against errors in the memory.

Hot-plug I/O and memory – Add memory or I/O after installation without service interruption.

DIMM sparing – Swaps "defective" DIMMs with installed but otherwise unused DIMMs.

X8 single device data correction (X8 SDDC) – Allows you to fix the failure of an entire DRAM device on-the-fly by removing a single DRAM from the memory map and recovering its data into a new device.

## PCI Express Reliability/Availability/Serviceability (RAS) enhance I/O availability

PCI Express is rich in RAS capabilities critical to maintaining system uptime.

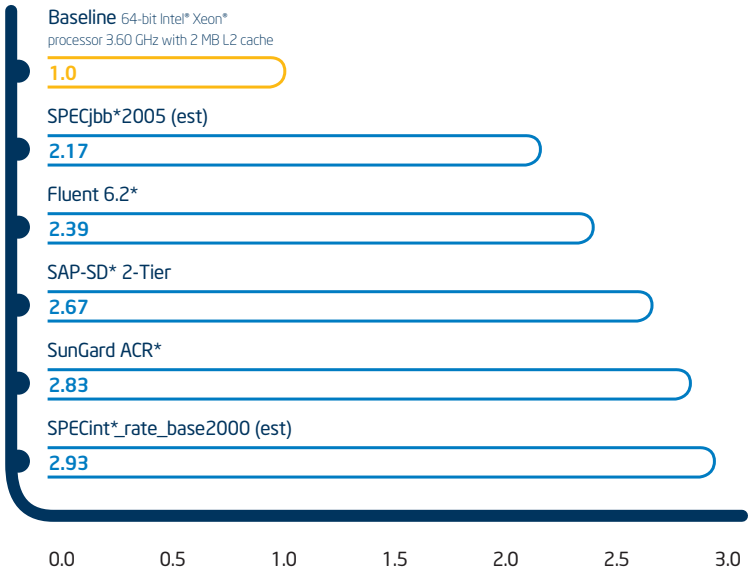
- Built-in clocking for Data Integrity Checking.
- Advanced error logging and reporting through IPMI.
- Hot-plug capability simplifies replacement of failed devices and helps reduce system downtime, while allowing mix and match of peripherals and systems or I/O chassis from different vendors.
- A high-performance, cost-effective RAID can be implemented on the server board using the Intel® IOP332 I/O processor, designed to connect directly to the chipset's memory controller via PCI Express.

## The Dual-Core Intel Xeon processor LV 2.0 GHz feature set includes:

- 2.0 GHz processor speed
- 31 Watts total dissipated power (TDP)
- Dual-core processing
- 36-bit PAE addressing
- 2 MB L2 cache
- Demand-Based Switching
- Execute Disable Bit functionality
- 65nm process technology

## Dual-Core Intel® Xeon® processor LV 2.0 GHz: Server Platform Performance

Performance per system watt comparison with previous generation




Relative Performance: Higher is Better

For more information about Intel low-power server platforms based on Dual-Core Intel® Xeon® processors, please visit **www.intel.com/business/bss/products/server/power.htm**

# Benchmark notes

SPECint*_rate_base2000: This benchmark evaluates the integer throughput of the measured system. Intel internal measurement (Feb 2005).

Baseline Platform configuration: Intel® Server Pre-Production Coyote System with two 64-bit Intel® Xeon® processors 3.60 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 800 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Microsoft Windows 2003 Server Enterprise Edition.* SPEC binaries built with Intel C++ Compiler 9.0.

New Platform Configuration: Intel® Server Pre-Production Alagash System with two Dual-Core Intel® Xeon® processors LV 2.0 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 667 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Microsoft Windows 2003 Server Enterprise Edition.* SPEC binaries built with Intel C++ Compiler 9.0.

SPECjbb* 2005: This workload evaluates the performance of Server-side Java Application. Performance measured in Business Operations Per Second. (Bops). Intel internal measurement (Feb 2005).

Baseline Platform configuration: Intel® Server Pre-Production Coyote System with two 64-bit Intel® Xeon® processors 3.60 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 800 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Microsoft Windows 2003 Server Enterprise Edition.* BEA WebLogic JRockit* 5.0 jvm.

New Platform Configuration: Intel® Server Pre-Production Alagash System with two Dual-Core Intel® Xeon® processors LV 2.0 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 667 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Microsoft Windows 2003 Server Enterprise Edition.* BEA WebLogic JRockit* 5.0 jvm.

SAP-SD* 2-tier: SAP-SD measures the performance of Enterprise resource planning servers using mySAP Business suite.* It measures performance in number of users. Intel internal measurement (Feb 2005).

Baseline Platform configuration: Intel® Server Pre-Production Coyote System with two 64-bit Intel® Xeon® processors 3.60 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 800 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Microsoft Windows 2003 Server Enterprise Edition.* Application server: SAP R/3 Enterprise* v4.7 SR1. Database: Microsoft SQL Server 2000.* SAP 2-Tier SD* benchmark kit.

New Platform Configuration: Intel® Server Pre-Production Alagash System with two Dual-Core Intel® Xeon® processors LV 2.0 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 667 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Microsoft Windows 2003 Server Enterprise Edition.* Application server: SAP R/3 Enterprise* v4.7 SR1. Database: Microsoft SQL Server 2000.* SAP 2-Tier SD* benchmark kit.

Fluent 6.2*: This HPC workload evaluates the performance of a Computational Fluid dynamics application. Performance measured in jobs/day. Intel internal measurement (Feb 2005).

Baseline Platform Configuration: Intel® Server Pre-Production Coyote System with two 64-bit Intel® Xeon® processors 3.60 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 800 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Red Hat Enterprise Linux* AS release 4 (Nahant Update 2) EM64T[Δ].

New Platform Configuration: Intel® Server Pre-Production Alagash System with two Dual-Core Intel® Xeon® processors LV 2.0 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 667 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Red Hat Enterprise Linux* AS release 4 (Nahant Update 2) 32-bit version.

SunGard ACR*: This benchmark evaluates the performance of a Financial Services system. Intel internal measurement (Feb 2005)

Baseline Platform configuration: Intel® Server Pre-Production Coyote System with two 64-bit Intel® Xeon® processors 3.60 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 800 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Microsoft Windows 2003 Server Enterprise Edition.*

New Platform Configuration: Intel® Server Pre-Production Alagash System with two Dual-Core Intel® Xeon® processors LV 2.0 GHz with 2 MB L2 Cache, Intel® E7520 Chipset, 667 MHz FSB; 8 GB DDR2-400 memory (8x1GB); OS–Microsoft Windows 2003 Server Enterprise Edition.*

Performance Per Watt Computation: Performance Per Watt for these workloads was computed using system power measurements made for the SunGard ACR* workload.

## Disclaimers

Relative performance for each benchmark is calculated by taking the actual benchmark result for the first platform tested and assigning it a value of 1.0 as a baseline. Relative performance for the remaining platforms tested was calculated by dividing the actual benchmark result for the baseline platform into each of the specific benchmark results of each of the other platforms and assigning them a relative performance number that correlates with the performance improvements reported.

Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel® products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, reference http://www.intel.com/performance/resources/benchmark_limitations.htm or call (U.S.) 1-800-628-8686 or 1-916-356-3104.

Δ Intel® EM64T requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel EM64T. Processor will not operate (including 32-bit operation) without an Intel EM64T-enabled BIOS. Performance will vary depending on your hardware and software configurations. See http://developer.intel.com/technology/64bitextensions/ for more information including details on which processors support Intel EM64T or consult with your system vendor for more information.

Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance.

* Other names and brands may be claimed as the property of others.



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